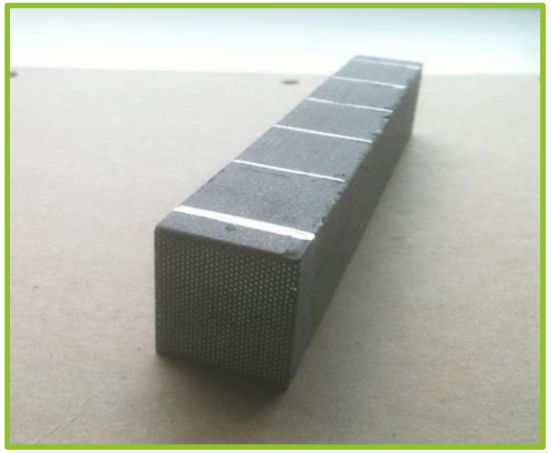
BiWeekly sPHENIX EMCal Mtg
BNL Update 8/03/2015

Produced new higher quality mold for 2D projective module

- 1 input / 1 output port with internal manifold
- Flow epoxy through short distance across mold
- Separate 98 and 100% screens
- Uses trimmed-border screens to reduce necessary machining
- Denser, 100% filled printing process

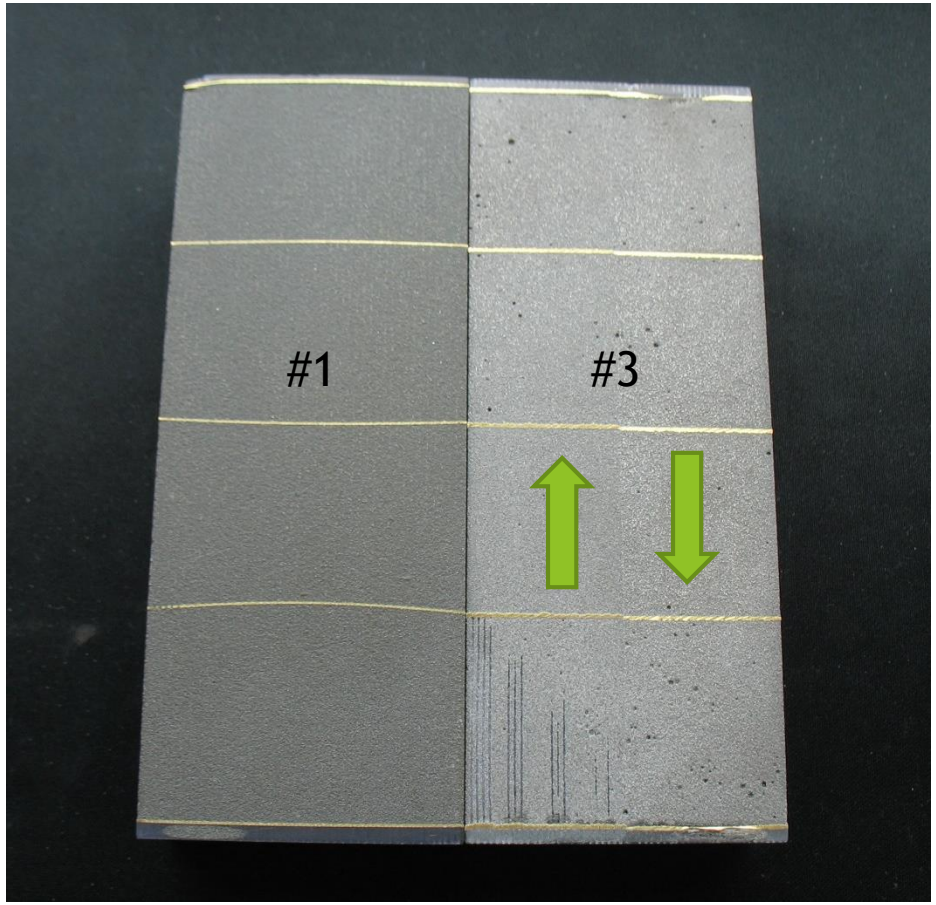


Tungsten/fiber modules from Tungsten Heavy Powder.

- Received 3rd module

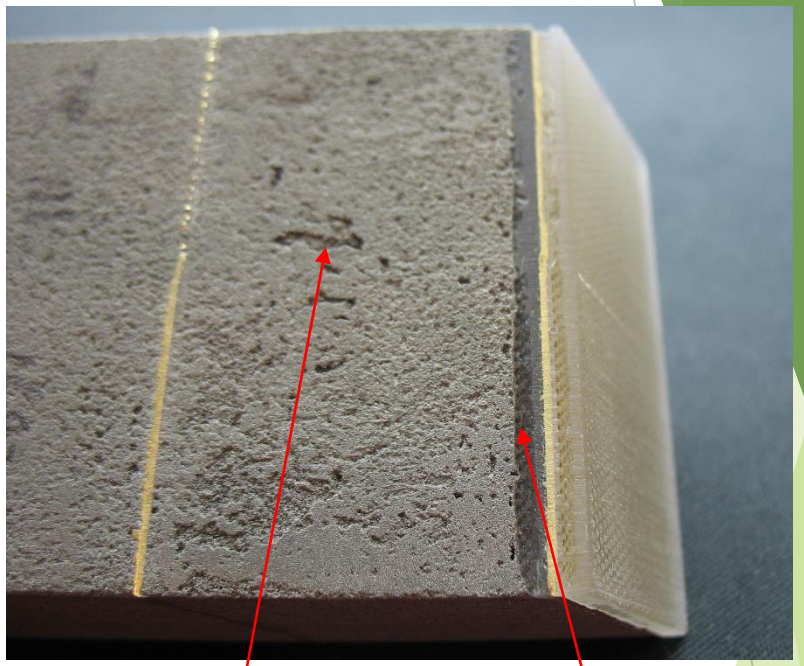
- Density is similar to others
- Problem with machining of fibers – damaged perimeter fibers
- Surface finish different from previous 2 samples?
- Fiber fill – 100%
- Fiber positioning – good
- Screen alignment - good

	Module #		
	I	II	III
module weight (g)	1699	1716	1682
module avg density (g/cm3)	9.07	8.98	8.96
W/epoxy region density (g/cm3)	9.75	9.63	9.74



Different finish coating?

Surface Milling cuts
2 directions



Surface
Roughness/bubbles

Epoxy gap
(no W-powder)

Tungsten powder/epoxy density

Test Blocks Calculations						
	Tungsten Pour			Final Densities		
Block	Tungsten No Vibration Density (*g/cm^3*)	Tungsten Vibration Density *(g/cm^3)*	Percent Change in Density Due to Vibration & Top Off (*g/cm^3*)	Tungsten Epoxy Mass (*g*)	Tungsten Epoxy Volume (*cm^3*)	Tungsten Epoxy Density (g/cm^3)
I	10.12	10.19	+ 0.69%	93.6	7.97	11.7
II	9.91	10.31	+ 4.04%	98.2	8.47	11.6
III	9.51	10.58	+ 11.25%	90.4	7.66	11.8
					Average:	11.7

EmCal Calculations							
Method I Tungsten Brick Density							
Brick	Total Mass (g)	Fiber & Screen Mass (g)	Tungsten Epoxy Mass (g)	Total Volume (cm^3)	Fiber & Screen Volume (cm^3)	Tungsten Epoxy Volume (cm^3)	Tungsten Epoxy Density (g/cm^3)
I	706.4	23.49	682.91	79.52	17.83	61.68	11.07
II	747	25.01	721.99	84.08	19.27	64.82	11.14
Note: Approximated Screen Mass						Average:	11.11

EmCal Calculations		
Estimated Densities		
Overall Density Goal	Overall Density to Pure Density Ratio	Pure Density Required
10.000	1.250	12.500
8.884	1.250	11.105
Note: 8.885 is current overall density		

EmCal Calculations			
Statistics			
Fiber Volume Percent	Fiber Mass Percent	Screen Volume Percent	Screen Mass Percent
21.6%	2.6%	0.8%	0.7%

The average test block density and the average brick density (in green) are very similar. This suggests that our bricks were reaching the highest density possible with this method of filling.

After calculating the above densities, an estimation was made. The furthest left table shows what the pure tungsten and epoxy density would have to be in order to get the overall density. In order to get 10 g/cm^3 we would have to increase our pure Tungsten and Epoxy density up to 12.5 g/cm^3 which may be unreasonable.

2D Projective tower production – tilted wire frames

The next step to take will be to create the bowtie mold. This mold will then be filled with tungsten powder and epoxy. This should give us a better look at the fiber registration.